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ABSTRACT

The impact of certain types of training on labor productivity or performance in different settings was assessed. In the manufacturing sector, it was found that the extent of in-house, employer-sponsored, job-related training has a positive relationship with output per labor hour. The extent of this type of training received out-of-house did not appear to have this positive association. In the case of managerial and professional employees at two large manufacturing companies studied, attendance at a formal training program appeared to have a positive impact on rated performance. At one of the two companies, however, salary growth did not reflect the positive training-performance relationship. Study results had these implications for human resources management: (1) a company's formal training programs should be chosen with care; (2) some direct evaluation of the contribution of these programs is possible; and (3) the interface between training and other personnel practices, in particular compensation policy, should be carefully considered. (YLB)

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FORMAL TRAINING AND LABOR PRODUCTIVITY*

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It has been estimated that this year, U.S. employers will spend from $30 to $50 billion training their employees.[1] This training will come in packages of all sorts. For instance, it can be given at the work location or at some other site; it can take place in a classroom or on the job; it can involve teaching skills or teaching behavior; it can be for production or non-production employees. Because the types of training programs in existence are so varied, one must display caution in making generalizations about their value. While training of a given sort in a given setting may have a positive impact on employee performance, training of a different sort or in a different environment might not.

This study assesses the impact of certain types of training on labor productivity or performance in different settings. Section I of the analysis focuses on the manufacturing sector. It presents production function estimates which permit us to assess the productive value of in-house and outside "employer-sponsored job-related" training. Our econometric results reveal that in-house training of this form is associated with higher labor productivity; this type of training received out-of-house does not appear to have a similar association.

The second section of the study examines the impact of training of all forms on the apparent contribution of managerial and professional employees at two major U.S. corporations. The section's results imply that in some settings managerial and professional training has a positive effect on managers' or professionals' productive contributions, at least at the two companies under analysis.

The concluding section summarizes our results and discusses their main implications.

I. Formal Training in the Manufacturing Sector

Our manufacturing analysis uses production functions similar to those which have been used to investigate the effects of differences in schooling on productivity.[2] These production functions are estimated using 1977 state-level data for each of 20 manufacturing industries. The variables of greatest interest are those indicating the percentage of usual hours worked in each state-by-industry cell devoted to employer-sponsored job-related training (ESJRT) taken in-house and ESJRT taken outside the work location.

The Model

Assume that our production function can be written as:

$$(1) \quad \log Q_t = \alpha \log L_t + (1 - \alpha) \log K_t,$$

where Q equals output (in period t),

L equals labor,

K equals capital,

and α equals labor's share of total costs.

We assume that all training goes to new hires, whose retention patterns may vary. Let

H_t = the total hours of newly hired workers,

N_t = the total hours employed,

F'_t = the proportion of total hours new hires spend in training,

c = the proportion of training time involving no production,

$h_t = H_t/N_t$,

T_t = the total training time,

F_t = (total hours of training/total hours of employment),

$= F'_t H_t/N_t = F'_t h_t$,

$T_t = F'_t c H_t = F'_t c h_t N_t = F_t c N_t$,

and S_j = the proportion of workers hired who are still attached to their firm j periods after their date of hire.

Our labor input can be represented as

$$(2) \quad L_t = N_t - F_t c N_t + r \sum_{j=1}^{J} S_j F_{t-j} c N_{t-j},$$

where r = the rate of return on training ignoring that the work life is finite,

and J = the maximum number of periods anyone stays attached to his or her firm.

Assume that employment is roughly constant; then

$$(3) \quad L_t = N_t(1 - F_t c + \sum_{j=1}^{J} S_j F_{t-j} c).$$

Using the approximation that $\log(1+x) \approx x$, when x is small, we get:

$$(4) \quad \log L_t \approx \log N_t + c[r \sum_{j=1}^{J} S_j F_{t-j} - F_t].$$

Substituting (4) into (1) yields:

$$(5)\quad \log Q_t = \alpha \log N_t + (1-\alpha)\log K_t + \alpha c\left[r \sum_{j=1}^{J} S_j F_{t-j} - F_t\right],$$

which can be rewritten as:

$$(6)\quad \log (Q/N)_t = \alpha \log(K/N)_t + \alpha crS_h F_{t-h} - \alpha c F_t + \alpha r c Z_t,$$

where, Z_t, the omitted variable, equals $\sum_{j \neq h} S_j F_{t-j}$.

In the appropriate auxiliary regression, which summarizes the basic relationships between equation (6)'s omitted and included independent variables,

$$(7)\quad Z_t = b_0 + b_1 \log(K/N)_t + b_2 F_{t-h} + b_3 F_t,$$

we would expect b_2 and b_3 to be positive. Therefore, the expected value of the coefficient of F_{t-h} in equation (6) is: $-\alpha crS_h + \alpha crb_2 = \alpha cr(S_h + b_2)$, and the expected value of the coefficient of F_t in (6) is: $-\alpha c + \alpha rcb_3 = \alpha c(-1 + rb_3)$. The coefficient of F_{t-h} is biased upwards because it picks up part of the effect of training in previous years, while that of F_t (whose true coefficient, $-\alpha c$, is negative) is biased toward or through zero. Unfortunately, the relative size of the biases involved is by no means obvious since it depends on the S_j's and how the S_j's and F_t's correlate over time, which determine the coefficients b_2 and b_3.

The State-by-Industry Data

Our production function estimates are based on cross-"state" data for twenty 2-digit Standard Industrial Classification (SIC) manufacturing industries. Twenty state groups, called "states," could be identified with the Survey of Adult Education (discussed below), which is the source of our training data. The data are either for 1977 or for years in the 1972-77 period. To estimate a production function like the one given by (5), state-by-industry data on output, capital services, number of establishments, and formal training were sought.

The 1977 Census of Manufactures (COM) was the source of value added data (on a state-by-industry basis). This is the output measure on which the results presented below are based. Variations in value added are thus assumed to reflect variations in output rather than price.

The 1977 capital stock data were provided by Jonathan Leonard.[3] His capital series was derived by generating estimates of the capital owned and rented in 1964, then adding deflated investment flows for the years from 1964 to 1976 to these capital stocks, and then subtracting the amount of depreciated capital from the gross stock estimates.

Our figures on the fraction of hours spent in employer-sponsored job-related training are derived from the Survey of Adult Education (SAE), conducted by the Bureau of the Census as part of the May Current Population Surveys (CPS) in 1969, 1972, 1975, 1978, and 1981. (The 1981 data have not yet been processed.) In each CPS interview, questions were asked to determine whether an individual had taken part in some type of organized adult education

during the past 12 months; if so, the SAE questionnaire was left to be filled out and returnad by mail. (Thus, a given SAE covers the period from May of period t-1 to May of period t.) Space was left for the respondent to give his or her descriptions of up to twenty (twenty-three in 1978) courses. In 1975 full-time students under the age of 35 did not receive SAE questionnaires; for consistency, we excluded this group from the 1978 SAE sample.

The first variable constructed with the SAE was the percentage of various groups of employees who received employer-sponsored (where "sponsored" means "were reported to have paid for") job-related training (ESJRT). The determination as to whether or not a course was employer-sponsored was made with the following question:

12. Who paid for this course or activity? *(Mark all that apply)*	1. Self or family	1 ☐	
	2. Employer	2 ☐	
	3. Public funding	3 ☐	
	4. Private organization (church, professional association)	4 ☐	
	5. Other *(Describe)*	5 ☐	
	6. Don't know	6 ☐	Describe

in 1975. Whenever the respondent marked "Employer" we took this to indicate that the training was employer-sponsored. In 1978 the question changed, so that "Employer" no longer appeared as a response to the "Who paid for...?" question; instead, if the employer was one of the sources of training, the respondent checked "Yes" for the question, "Is your employer one of the sources...?":

10a. Who paid for this course or activity? (MARK (X) ALL THAT APPLY)	1. Self or family	(016) 1 ☐	
	How much did you and your family pay for tuition and required fees?	(017)	$ _____ .00 (Dollars only)
	2. Public funding (Federal, State, county or local government agency, including public schools)	(018) 2 ☐	
	3. Business or industry	3 ☐	
	4. Private organization (such as, church, professional association, YMCA, or Red Cross)	4 ☐	
	5. Other (Describe)	5 ☐	_____ (Describe)
	6. Don't know	6 ☐	
10b. Is your employer one of the sources of payment marked in 10a?	1. Yes	(019) 1 ☐	
	2. No	2 ☐	

Hence in 1978 we took a "Yes" response to question 10b to indicate that the training was employer-sponsored.

With the 1975 microdata, the assessment as to whether training was "job related" was based on the following query:

3. Why did you take this course or activity? (Mark the main reason)	1. For general information	1 ☐	
	2. To improve or advance in job	2 ☐	
	3. To get a new job	3 ☐	
	What kind? (Be as specific as possible)		_____
	4. For community activity	4 ☐	
	5. For personal or family interests	5 ☐	
	6. For social or recreational reasons	6 ☐	
	7. Other (Describe)	7 ☐	_____ Describe

The second and third responses were taken as indicating that training was "job related." In 1978, the questionnaire contained more detail about the purpose of training:

4. Why did you take this course or activity? (Mark (x) ONE MAIN REASON)	*1. To improve, advance, or keep up-to-date in my current job	(067) 1 ☐
	*2. To get a new job in my current occupation or in an occupation I have worked in previously	2 ☐
	*3. To get a job in a new occupational field	3 ☐
	4. Other job-related reason (Describe)	4 ☐ _____ (Describe)
	5. To prepare for naturalization as an American citizen	5 ☐
	6. For general education	6 ☐
	7. For personal or social reasons (such as, community activity, home and family life, personal development, social and recreational interests)	7 ☐
	8. Other non-job-related reason (Describe)	8 ☐ _____ (Describe)

Here, each of the first four responses was taken to indicate that training was job-related.

Separate training participation rates were derived for training taken anywhere and for training taken at work. The questions on which this distinction was based were:

5. Where did this course, class or activity USUALLY take place? (Mark one)	1. School building	1 ☐
	2. College or university building	2 ☐
	3. Community Center	3 ☐
	4. Church, or other religious property	4 ☐
	5. Place of work	5 ☐
	6. Private home	6 ☐
	7. Hotel or other public commercial building	7 ☐
	8. Other (Describe)	8 ☐ _____ Describe

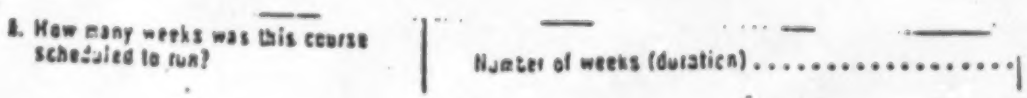
in 1975, and:

14. Was this course or activity USUALLY given at your place of work?	1 ☐ Yes 2 ☐ No	(025) 1 ☐ Yes 2 ☐ No

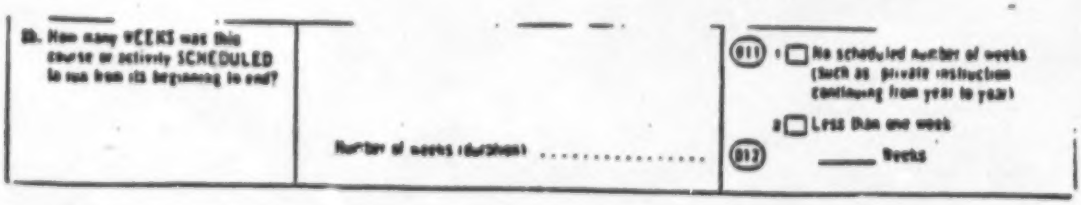
in 1978.

In addition to the training percentages, separate estimates were made of annual hours per employee in employer-sponsored job-related training taken anywhere and taken at work. These estimates were calculated as the product of four variables for the appropriate cell: the relevant training participation rate, the number of relevant courses per employee who took training, the mean number of weeks per relevant course, and the mean number of hours of training per week trained in relevant courses.

The key questions for deriving the set of per employee figures were those pertaining to weeks per relevant course, and those pertaining to hours per week of training. Let us first consider the weeks per relevant course question. In 1975, the question read:



In 1978, it was


8b. How many WEEKS was this course or activity SCHEDULED to run from its beginning to end?
Number of weeks (duration) .....
011
No scheduled number of weeks (such as private instruction continuing from year to year)
Less than one week
012
Weeks

To effect as much consistency as possible between the two years, we took two steps. First, we excluded correspondence courses from the 1975 calculations, since these courses were the primary type which had "no scheduled number of weeks." Second, we excluded 1978 courses which were marked as "less than one week," on the ground that these courses would have elicited "0 weeks" responses in earlier surveys; comparisons of the distributions of hours across surveys strongly supports this action.

In 1975, the hours per course week question was:

7. How many HOURS A WEEK were you SCHEDULED to attend the course or take part in the activity?	Hours per week..... Note: If this is an "unscheduled" activity such as a correspondence course, enter average hours spent per week.	_____

In 1978, the survey was altered to ask only about scheduled training hours:

8a. How many HOURS A WEEK were you SCHEDULED to attend this course or activity? _____	Number of hours per week.....	(018) = ☐ No scheduled number of hours (such as, a correspondence course) _____ Hours

Again, excluding correspondence courses from each year's hours tabulations most likely reduces any cross-survey differences in the treatment of courses with "no scheduled number of hours."

Estimates were made of annual hours per production worker in state-by-industry cell in employer-sponsored job-related training taken anywhere, taken at work, and taken away from the workplace. In each case, the per-employee figure was calculated as the product of four variables (the relevant training participation rate, the number of relevant courses per employee who took training, the mean number of weeks per relevant course, and the mean number of hours per week of training in relevant course). For the present regression analysis, a "fraction of total hours spent in formal training" variable was constructed. This figure is the ratio of our annual hours of employer-sponsored job-related training per employee estimate to the average number of annual hours worked per employee, computed from the May Current Population Surveys of 1975 and 1978 as the product of reported usual weekly hours worked and an assumed 50 weeks worked per year.

The Results

Our production function estimates are presented in Table 1. Model 1 explains labor productivity in terms of two training variables--the fraction of total hours involved in ESJRT in 1977/78 and the fraction in 1974/75--and two standard production function variables--the capital-labor ratio and total hours per establishment, both in logarithmic units. The total hours per establishment variable permits us to test whether or not returns to scale are constant, as was implicitly assumed in equation (6), in which log N does not appear as an independent variable.

The model also includes 19 industry and 3 region dummy variables, which are taken as controls for differences in technologies and product market conditions. Model 1's estimated coefficients imply that formal training has a positive effect on labor productivity, at least in the manufacturing sector. Model 2 is analogous to model 1 except that it includes separate 1977/78 and 1974/75 fractions for in-house and out-of-house training. The Model 2 point estimates imply that, at least within the manufacturing sector, it is training received at the place of work which has the positive impact on productivity; training received out-of-house seems to be of much more questionable productive value.

In both Models 1 and 2 the estimated coefficient of the capital-labor ratio variable was about 0.3. If the relevant technologies are Cobb Douglas, as assumed, this figure should be equal to capital's share of value added. Given the accounting system used for the Census of Manufactures,[4] this number is much closer to 0.5. The fact that the estimated value is so much lower than what would have been expected given the Cobb Douglas assumption may reflect non-systematic measurement error in the capital-labor ratio variable. Since the estimated coefficients of the training percentages are likely to be biased by an

TABLE 1

The Impact of Employer-Sponsored Job-Related Training on Productivity in U.S. Manufacturing in 1977[a]
(N = 222)

		Dependent Variable: Ln (Value added per million employee hours)[b]		Dependent Variable: Ln (Value added per million employee hours) - .5 Ln(capital per million employee hours)[c]	
	Mean [S.D.]	(1)	(2)	(3)	(4)
Independent Variables:					
Fraction of total hours involved in ESJRT in current year (1977/78) x 10	.016 [.034]	-.041 (.309)	--	.075 (.325)	--
Fraction of total hours involved in ESJRT 3 years ago (1974/75) x 10	.027 [.073]	.204 (.136)	--	.189 (.144)	--
Fraction of total hours involved in in-house ESJRT in current year (1977/78) x 10	.003 [.013]	--	1.006 (.748)	--	.736 (.792)
Fraction of total hours involved in in-house ESJRT 3 years ago (1974/75) x 10	.012 [.054]	--	.275 (.178)	--	.242 (.189)
Fraction of total hours involved in out-of-house ESJRT in current year (1977/78) x 10	.013 [.029]	--	-.308 (.351)	--	-.091 (.370)
Fraction of total hours involved in out-of-house ESJRT 3 years ago (1974/75) x 10	.016 [.047]	--	.083 (.215)	--	.098 (.228)
Ln(capital per million employee hours)	8.641 [.722]	.324 (.036)	.316 (.037)	--	--
Ln(million total employee hours per establishment)	-2.153 [.761]	.039 (.025)	.040 (.025)	.006 (.025)	.006 (.025)
Region dummies (3)	--	yes	yes	yes	yes
Industry dummies (19)	--	yes	yes	yes	yes
R^2	--	.875	.877	.647	.649
SEE	--	.138	.138	.145	.145

Notes: a. Standard errors enclosed in parentheses below parameter estimates. Each model includes a constant term.
b. Mean [S.D.] of dependent variable = 2.678 [.363].
c. Mean [S.D.] of dependent variable = -1.643 [.229].

underestimate of the "true" coefficient on the capital intensity variable, we imposed the value of 0.5 on this coefficient in production function Models 3 and 4. As can be seen, our basic conclusions concerning the relationship between labor productivity and both in-house and out-of-house formal training do not appear to be mere reflections of a poorly measured capital-labor ratio.

II. Formal Exempt Employee Training at Two Large Companies

This section examines the relationship between formal training and both the salary growth and rated performance of white male[5] exempt (roughly, managerial and professional)[6] employees at two major U.S. corporations. The results are consistent with the claim that formal training improves managers' and professionals' performance to the firm.

The Company B and Company C Personnel Data Files

Two large corporations in the U.S. manufacturing sector, hereafter called Company B and Company C, have provided computerized personnel records for virtually all the members of their exempt workforces. The Company B records contain information entered through July 1, 1977, including a complete log of all personnel actions since 1971 for persons active on or after September 1, 1976, and an abbreviated personnel action log for persons active on or after January 1, 1974. The Company C data file had a separate segment for each year from 1973 through 1977, each segment containing a record for every exempt employee who was "active" with the company at any time during the given year. Each employee record for both companies included information on the employee's education, length of company service, date of birth, physical work location, current job grade, date of entry into current job grade, current salary, and recent salary increase history. Each record in our files also includes

information on rated performance and attendance at formal training programs.[7]

Performance Ratings at Company B and Company C

The piece of information that most distinguishes a typical company personnel file from other sources of economic microdata is the assessment of how well each individual performs his or her job. At both Company B and Company C, supervisors review each managerial and professional employee's performance once a year.

Company B's "Supervisor's Guide for Performance Review and Development Planning," in use from 1970 through the end of 1976, offered the following suggestions to the reviewer:

> The performance review of employees demands care and attention and should be carried on without distractions or interruptions. Before you begin a performance review, refresh your knowledge of the content of the employee's position description. If only a generalized description is available, take time to think through the specific components of the job. It is very important that you analyze how the employee is performing in each of his areas of major responsibility. The more concrete your thoughts are, the more helpful your suggestions will be. The review should cover a sufficiently long span so that a pattern of performance can be observed. Except for extremely unusual cases, a period of 4 to 6 months experience with the employee should be sufficient to enable you to make objective judgments about him and thus complete a performance review.
>
> Considering the employee's performance over an extended period will aid greatly in minimizing the influence of recent incidents and will help you to be objective and fair minded. Each factor being reviewed should be considered separately and be based on fact rather than opinion.
>
> Reviews should be based on the employee's performance in his present position and only for the period since his last review. Since previous ratings should not be allowed to influence the current reviews, many managers prefer to make their evaluations without having the past records at hand.

The supervisor began the review by listing up to four of his subordinates strengths ("He is particularly good at:"), and indicating whether "each is (essential, important, supplementary) to his job." The supervisor then indicated up to four areas where there was room for improvement ("He could use

help in:") and the relative importance of each to the subordinate's job.

Finally, the reviewer was told:

> Now that you have completed your analysis of his strengths and opportunities for improvement, check the box opposite the paragraph that most nearly describes your evaluation of his overall performance:
>
> ___ EXCELLENT: Consistently exceeds expected performance in accomplishing objectives and position requirements.
>
> ___ SUPERIOR: Exceeds expectations and demonstrates high level performance in accomplishing objectives and position requirements.
>
> ___ GOOD: Accomplishes objectives and position requirements as originally anticipated and in a manner resulting in expected performance.
>
> ___ SATISFACTORY: Acceptable performance of position requirements with indication of ability for improvement.
>
> ___ MINIMUM ACCEPTABLE: Probationary performance level for employees in same position for more than twelve months, requiring consultation with the employee and a specified plan for improvement within a designated period of time.
>
> ___ UNACCEPTABLE: Unsatisfactory. Does not perform at an acceptable level of accomplishment.

The rating chosen then became the basis of the rater's recommendation for a salary action (which was reviewed by the appropriate group of the rater's superiors). No ratings in the bottom two categories were observed.

At Company C, two separate performance measures are recorded: an overall performance rating and a ranking of each employee relative to others in an appropriate comparison group.

Performance ratings are prepared initially by each employee's immediate supervisor. The rating form in use during the period under analysis gave supervisors the following instructions:

> Each employee should be rated on current performance and contributions based on requirements of his present assignment. An employee should be measured both as to his contributions in terms of the standards of his job and against others performing similar work at similar levels. Career potential and promotability should not enter into ratings of an individual's performance.

Prior to 1976, the overall rating scale consisted of nine categories; beginning

in 1976, the number of appraisal categories was cut to six by combining the top two categories and merging the bottom three categories of the old rating scale.

In addition to rating the performance of each subordinate, supervisors at Company C are required to rank each employee relative to a group of his or her peers. Management provides each supervisor in a department or other appropriate organizational unit with a list of employees doing reasonably comparable levels of work.

> The list of employees normally includes only persons in the same grade level, but may include persons in several adjacent grade levels if such broader coverage is needed in order to obtain a reasonably sized comparison group within any division.

The supervisor is first told to strike off the list employees "whose work you do not know well" or "whose work in your opinion is so different from most of the others that you do not think he (or she) can be compared with them," and is then instructed to rank the remaining people. The ranking is done by first picking the best employee on the list, then picking the worst employee, next designating the best employee of those remaining on the list, then designating the worst employee of those remaining on the list, and so on until all of the employees have been ranked. The same criteria as are used in assigning the performance ratings underlie the rankings. That is, employees are ranked on the basis of how well each is meeting the requirements of his or her own particular assignment compared to how well others are meeting the requirements of their assignments. Rank group lists are designed to be as large as is practicable, with as many supervisors as possible serving as rankers for each group consistent with their having adequate knowledge of the employees being ranked.

After all of the supervisors at a given level of the corporate hierarchy have assigned performance ratings to their subordinates and ranked those employees whose work they are qualified to assess, the rating and ranking forms are reviewed by managers at the next level of the corporate hierarchy. Any major disparities among rankers are reconciled and a consensus is reached regarding each employee's position in his or her ranking group.

Finally, the performance ratings made by the immediate supervisors may be modified so that they are consistent with the consensus rankings and so that the overall distribution of ratings within each ranking group is reasonably consistent with the distribution of ratings expected by the company. In all years, after modification, the actual distribution of ratings closely matched the desired distribution. In 1976, for example, the actual proportions of those included in our total sample (as opposed to the regression sample) who received each rating versus the proportions of employees the company wanted to receive each rating were as follows (from best rating to worst rating): 9 percent versus 10 percent; 25 percent versus 25 percent; 26 percent versus 25 percent; 25 percent versus 25 percent; and (for the bottom two rating categories combined) 15 percent versus 15 percent.

Training Data for Companies B and C

The records in our company files contain a history of company-sponsored job-related training for each employee. Company B provided data which noted the month and year of commencement of formal training programs entered by any employee prior to July 1, 1978; in addition, each record provided for up to ten separate courses of training through that date. The yearly Company C files had

fields for the date of commencement and coded description of training program for up to twelve courses per annual employee record. For each employee at each company, a training dummy variable was created; if an employee had a record of training in a year of measurement, this dummy was set to 1; otherwise it was assumed that the employee was untrained in the period of measurement, and the variable was set to zero.

Data Transformation and Sample Inclusion Criteria

The schooling information on each company file was used to categorize each employee by highest level of education attained as of each relevant year end. The four categories used were: less than bachelor's degree, bachelor's degree, master's degree, and doctorate. Each individual's service for Company B was computed as the length of time between reported date of hire and first salary measurement; in the case of Company C, company service as of the first measurement was reported directly on the file we received.

Pre-company experience was set equal to age minus schooling minus company service minus five. For this purpose, it was assumed that non-high-school graduates had spent 10 years in school, high school graduates 13 years, college graduates 16 years, master's degree holders 18 years, and Ph.D.s 21 years. Dummy variables were created which placed each location where employees worked in one of four regions: Northeast, North Central, South, or West.

The samples drawn from the two files only include employees in those grade levels into which the Company classifies its managerial and professional jobs. To be included in an analysis, an employee in a selected position or

grade level had to be white, male, "active," full time, regular, and domestically based for the years of salary measurement.

The basic sample for each company used to determine earnings position and performance position consisted of all members of the above group for whom the relevant activity, grade level, rating, and salary information was available. Estimation of the various models discussed below required the imposition of additional data availability criteria.

The Results for Exempt Employees

Table 3 presents estimates of salary growth equations which contain dummy variables for "trained in 12 months prior to salary increase measurement period (yes=1)" and "trained during salary increase measurement period (yes=1)," in addition to variables reflecting educational attainment, length of service, ln (salary), and grade level of an employee. The Model (1) estimates for Company B indicate that training last year did not have a meaningful impact on salary growth. Model (2) is identical to Model (1) except that it controls for rated performance. The fact that the estimated coefficients on the training variables are reduced by the introduction of the performance rating, which is positively rated to salary growth, indicates that exempt training is positively related to performance at Company B.

The salary growth results for Company C are quite different. In Model (1), training in the year prior to the salary increase measurement period had a small positive statistically significant effect on salary growth; attendance at a training program of any sort was associated with salary growth 0.5 percent above what would have been expected given an individual's personal characteristics. Model (2) is the same as Model (1) except that it controls

TABLE 2

The Impact of Employer-Sponsored Training on Salary Increases for White Male Managerial and Professional Employees at Two Major U.S. Corporations in 1977[a]
Dependent Variable: Percent Salary Change from 1976 to 1977[b,c]

	Company B (N=1,740)			Company C (N=6,598)		
	Mean [S.D.]	(1)	(2)	Mean [S.D.]	(3)	(4)
Independent Variables:						
Trained in 12 months prior to salary increase measurement period (yes = 1)	.148 [.355]	-.270 (.218)	-.312 (.216)	.145 [.352]	.454 (.183)	.265 (.177)
Trained during salary increase measurement period (yes = 1)	.148 [.355]	.087 (.219)	.071 (.217)	.136 [.343]	-.086 (.184)	-.215 (.178)
Less than bachelor's degree (yes = 1)	.540 [.499]	.859 (.201)	.735 (.200)	.390 [.488]	.446 (.173)	-.650 (.174)
Master's degree (yes = 1)	.081 [.273]	-.718 (.300)	-.658 (.298)	.132 [.338]	-.167 (.202)	.054 (.195)
Doctorate (yes = 1)	.024 [.153]	-1.142 (.533)	-1.054 (.528)	.042 [.201]	-.278 (.329)	.502 (.320)
Years of pre-company experience/10	1.000 [.775]	-.774 (.315)	-.676 (.312)	.465 [.548]	-.277 (.264)	.858 (.261)
(Years of pre-company experience)^2/100	1.599 [2.275]	.064 (.104)	.069 (.103)	.517 [1.206]	-.109 (.113)	-.131 (.109)
Years of company service/10	1.502 [.977]	-1.129 (.288)	-1.007 (.286)	2.049 [1.063]	-1.011 (.277)	.601 (.278)
(Years of company service)^2/100	3.228 [3.487]	.185 (.078)	.176 (.077)	5.330 [4.332]	.134 (.064)	.013 (.062)
Ln(annual salary)[d]	9.861 [.209]	-9.013 (.804)	-9.879 (.807)	10.180 [.247]	-17.280 (.864)	-26.628 (.945)
Performance rating 6 or worst (yes = 1)[e]	.014 [.117]	—	.254 (.651)	.015 [.123]	—	-4.719 (.506)
Performance rating 5 (yes = 1)	—	—	—	.149 [.356]	—	-2.307 (.199)
Performance rating 4 (yes = 1)	—	—	—	.194 [.395]	—	-1.243 (.172)
Performance rating 2 (yes = 1)	.572 [.495]	—	.905 (.161)	.219 [.413]	—	1.355 (.169)
Performance rating 1 or best (yes = 1)	.033 [.178]	—	1.939 (.440)	.096 [.294]	—	2.892 (.230)
Region dummies (3)	—	yes	yes	—	yes	yes
Grade-level dummies (6,10)	—	yes	yes	—	yes	yes
R^2	—	.144	.164	—	.136	.195
SEE	—	3.139	3.104	—	4.981	4.808

Notes: a. Standard errors enclosed in parentheses below parameter estimates. Each model includes a constant term.

b. Percent salary change was calculated as the natural logarithm of the annual salary at end of year minus the natural logarithm of the annual salary at start of year times 100. For Company B the calculations are for the year ending July 1, 1977; for Company C the calculations are for the year ending December 31, 1977.

c. Mean [S.D.] of dependent variable = 9.076 [3.375] for Company B; 8.621 [5.349] for Company C.

d. Annual salary computed as of July 1, 1976 for Company B, as of December 31, 1976 for Company C.

e. Performance ratings have been rescaled for cross-company uniformity. Those workers identified by "worst" ratings in fact received the lowest ratings actually given; in the case of Company B these do not correspond to the "worst" evaluation in the company rating scheme.

for rated performance. As the estimates in the table imply, this control reduces the apparent training effect to 0.3 percent, and causes the coefficient estimate to lose statistical significance. This finding implies that exempt training at Company C is associated with better performance, as it was at Company B.

Thus, the regression for Companies B and C indicate that there is a positive association between attendance at formal training programs and rated performance among managerial and professional employees. They also reveal that while the apparent productivity differential between the trained and the untrained is reflected in the salary growth differentials found at Company C, this apparent differential is not so rewarded at Company B. Hence, Company C can be expected to have better luck in retaining its trained, and seemingly more productive employees, than can Company B.

Conclusion

This paper has presented evidence which implies that at least some forms of formal training are positively associated with labor productivity. In the manufacturing sector, it was found that the extent of in-house training has a positive relationship with output per labor hour; however, the extent of outside training does not appear to have this positive association. In the case of the managerial and professional employees at the two large manufacturing companies studied, attendance at a formal training program appears to have a positive impact on rated performance. At one of the two companies, however, salary growth did not reflect the positive training-performance relationship.

The results of this study underscore a number of important issues for human resources management. First, it is important that a company's formal training programs are chosen with care. Second, it is possible, and most likely worthwhile, to do some direct evaluation of the contribution of these programs. Third, the interface between training and other personnel practices, in particular compensation policy, should be carefully considered.

In sum, this study represents a first tep toward directly assessing the productive value of formal training programs. Additional steps can and should be taken.

Footnotes

1. See ASTD National Report for Training and Development, Volume 5, Number 11, September 5, 1979, "How Much Training Do You Do," ASTD, Washington, D.C., and Robert L. Craig and Christine J. Evers, "Employers as Educators: The Shadow Education System," New Directions for Experiential Learning: Business and Higher Education—Toward New Alliances, San Francisco, Jossey Bass, September 1981.

2. See Zvi Griliches, "Production Functions in Manufacturing: Some Preliminary Results," in Murray Brown, ed., The Theory and Empirical Analysis of Production, New York, National Bureau of Economic Research, 1967.

3. See Jonathan Leonard, Does Affirmative Action Work?, Ph.D. thesis, Harvard University, May 1982.

4. In 1977, in the manufacturing sector, (total labor costs)/(value added) equalled .50: The Figures used in deriving this ratio are from U.S. Bureau of the Census, Census of Manufactures: 1977 General Summary, Washington, Government Printing Office, 1980, pp. 1-7 and 1-47.

5. The sample is limited to white males since it is believed that performance ratings are most valid for this group of employees.

6. More precisely, "exempt" employees are all those not covered by the overtime provisions of the Fair Labor Standards Act of 1938.

7. Both companies deleted information on the name, address, and social security number of each worker to insure employee anonymity. Neither company provided the personnal records for a very small number of their top executives, as the records contained sufficiently detailed information that these individuals might have been identifiable even without name, address, or social security number.